

Work Order ID 135170

July 31, 2015 3:28:06 PM

Page 1

Item ID: D350-748-243TRN

Revision ID:

Item Name: Crosstube Installation, High Aft

Start Date: 7/31/2015 Start Qty: 1.00

Required Date: 8/14/2015 Req'd Qty: 1.00

Reference:

Approvals: Process Plan: SA 20150731

QC: Date: Tooling: Date: SPC (Y/N): Date:

N900040100

Setup Start *NS1*

Stop *NS2*

Cust Item ID:

Customer:

Run Start *NR1*

Stop *NR2*

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr	Revision Nbr
D350-748-243	A

100

0.00

100

MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.03

Mori Seiki CNC Lathe Large

1-Fill tube with sand & install plugs on both ends as per Folio _____

2-Turn first side as per Folio _____

3- File transition lines smooth.

FOLIO REV: AB

DWG REV: A

110

QC1- Inspection performed by CMM

0.00

110

QC

Memo

0.00

Quality Control

MMML
15/08/14

MMML
15/08/18

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

Work Order: <u>135170</u> Part No. _____ NCR No. _____		DISPOSITION Rework ☒ Scrap ☐ Use-as-is ☐ Suspected Unapproved ☐		AGAINST DEPARTMENT/PROCESS <table style="width:100%; border: none;"> <tr> <td style="width:15%;">Skid-tube ☐</td> <td style="width:15%;">Cross tube ☐</td> <td style="width:15%;">Water Jet ☐</td> <td style="width:15%;">Engineering ☐</td> </tr> <tr> <td>Machining ☐</td> <td>Small Fab ☐</td> <td>Prod. Eng. Coord. ☐</td> <td>Quality ☐</td> </tr> <tr> <td>Thermoforming ☐</td> <td>Finishing ☒</td> <td>Rec/Store/Packaging ☐</td> <td>Other ☐</td> </tr> <tr> <td>Large Fab ☐</td> <td>Composite ☐</td> <td>Supplier ☐</td> <td></td> </tr> </table>						Skid-tube ☐	Cross tube ☐	Water Jet ☐	Engineering ☐	Machining ☐	Small Fab ☐	Prod. Eng. Coord. ☐	Quality ☐	Thermoforming ☐	Finishing ☒	Rec/Store/Packaging ☐	Other ☐	Large Fab ☐	Composite ☐	Supplier ☐																																																							
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Date : <u>15.08.10</u>		Step #: _____		QTY Effective : _____		MRB (QSI042) Approval <u>A.P.</u> <u>15.08.10</u>																																																																									
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Apply Axalta 132055 & Metalok 2305 Per manufacturer's instructions prior to paint NOT APPLICABLE A.P. 15.08.10				ACCEPTABLE PER TESTING BY CP.		Lead hand / Supervisor Approval Verification																																																																									
						QC / QA Coordinator Approval																																																																									

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Work Order ID 135170

July 31, 2015 3:28:06 PM

135170

Page 2

Item ID: D350-748-243TRN

Accept

N900040100

Setup Start

NS1

Revision ID:

Stop

NS2

Item Name: Crosstube Installation, High Aft

Start Date: 7/31/2015 Start Qty: 1.00

1

Cust Item ID:

Required Date: 8/14/2015 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals:

Process Plan:

Date:

Tooling:

Date:

Run Start

NR1

QC:

Date:

SPC (Y/N):

Date:

Stop

NR2

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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120

120

Mori Seiki

Mori Seiki CNC Lathe Large

MORI SEIKI CNC LATHE LARGE

Memo

0.05

1-Turn second side as per Folio _____
2- File transition lines smooth.
3-Scribe Part & Batch as per Dwg D350-748-143
FOLIO REV: 10
DWG REV: 10

130

130

QC

Quality Control

QC1- Inspection performed by CMM

0.00

Memo

0.00

140

140

QC

Quality Control

QC8- Inspect parts - second check

0.00

Memo

0.00

1 0

mm L
15/08/18

1 0

P.T.O.

mm L
15/08/19

1 0

DAS
47
9-89

15-04-16

DQA:

Date: 15/09/28



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed:

Date: 15/09/20

Work Order update only ☐

Work Order: <u>135170</u> Part No. <u>D350-748-243</u> NCR No. <u>15-5350</u> <i>JRN</i>	DISPOSITION Rework ☐ Scrap ☐ Use-as-is ☒ Suspected Unapproved ☐	AGAINST DEPARTMENT/PROCESS <table style="width:100%;"> <tr> <td>Skid-tube ☐</td> <td>Cross tube ☒</td> <td>Water Jet ☐</td> <td>Engineering ☐</td> </tr> <tr> <td>Machining ☐</td> <td>Small Fab ☐</td> <td>Prod. Eng. Coord. ☐</td> <td>Quality ☐</td> </tr> <tr> <td>Thermoforming ☐</td> <td>Finishing ☐</td> <td>Rec/Store/Packaging ☐</td> <td>Other ☐</td> </tr> <tr> <td>Large Fab ☐</td> <td>Composite ☐</td> <td>Supplier ☐</td> <td></td> </tr> </table>				Skid-tube ☐	Cross tube ☒	Water Jet ☐	Engineering ☐	Machining ☐	Small Fab ☐	Prod. Eng. Coord. ☐	Quality ☐	Thermoforming ☐	Finishing ☐	Rec/Store/Packaging ☐	Other ☐	Large Fab ☐	Composite ☐	Supplier ☐																																																	
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Description Work Order Deviation		Disposition		Completed By DAS 47 15-9-9 9-89 Lead hand / Supervisor Approval Verification DAS DAS 47 15-9-9 9-89 9-89 QC / QA Coordinator Approval DAS 9 9-89 15.09.20.																																																																	
Wall thickness measurement is out of tolerance.		Acceptable. Min wall is within 0.020 of dwg nominal																																																																			
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Work Order ID 135170

135170

Page 3

July 31, 2015 3:28:06 PM

Item ID: D350-748-243TRN

Accept

N900040100

Setup Start ***NS1***

Revision ID:

Stop ***NS2***

Item Name: Crosstube Installation, High Aft

Start Date: 7/31/2015 Start Qty: 1.00

1

Cust Item ID:

Required Date: 8/14/2015 Req'd Qty: 1.00

1

Customer:

Reference:

Approvals: Process Plan: _____ Date: _____ Tooling: _____ Date: _____

Run Start ***NR1***

QC: _____ Date: _____ SPC (Y/N): _____ Date: _____

Stop ***NR2***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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150

0.00

150

Large Fab

Crosstubes

Memo

0.02

Crosstubes

1-Grind machining marks

BL 15/09/16

190

0.00

190

Packaging

Packaging

Memo

0.00

Packaging

Identify and stock in kanban rack
Location: 16 003

BL 15/09/16

200

QC21- Final Inspection - Work Order Release

0.00

200

QC

Memo

0.02

Quality Control

MLJ SEP 2 1 2015

MLJ SEP 2 1 2015

DQA: _____ Date: _____



WORK ORDER NON-CONFORMANCE / UPDATE

QA Closed: _____ Date: _____

Work Order update only ☐

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Description Work Order Deviation		Disposition		Completed By																	
				Lead hand / Supervisor Approval Verification																	
				QC / QA Coordinator Approval																	
<table style="width: 100%; border: none;"> <tr> <td colspan="2" style="text-align: center; border-bottom: 1px solid black;">Root Cause</td> <td colspan="3" style="text-align: center; border-bottom: 1px solid black;">FAULT CATEGORY</td> </tr> <tr> <td style="width: 15%; vertical-align: top;"> Environment ☐ Design ☐ Doc/Data ☐ Equip/Tooling ☐ Handling/Pre ☐ Material ☐ Internal Transport ☐ Tribal Knowledge ☐ LOA ☐ Substation ☐ Past Expiry Date ☐ Misidentified ☐ </td> <td style="width: 15%; vertical-align: top;"> No Re-verification ☐ Operator ☐ Offset/Setup ☐ Supplier ☐ Training ☐ Use for Testing ☐ Poor Information ☐ Rushing ☐ Product Improvement ☐ Process Improvement ☐ Manufacturing Process ☐ Past Due ☐ </td> <td style="width: 15%; vertical-align: top;"> Pressure/Forced ☐ Bending ☐ Centre Not Concentric ☐ Cracks ☐ Crimp/Kink/Ripple/Wave ☐ Cuffs ☐ Crushing ☐ Heat Treat ☐ Wave/Twist in Tube ☐ Marks/Chatter ☐ </td> <td style="width: 15%; vertical-align: top;"> Temperature/Cure ☐ Set-up ☐ BOM/Route ☐ Broken/Damage/Defect ☐ Inspection Incomplete/Unqualified ☐ Contamination ☐ Countersink ☐ Cut Too Short ☐ Instructions Incomplete/Unclear ☐ Drill Holes ☐ </td> <td style="width: 15%; vertical-align: top;"> Power Loss/Surge ☐ Folio/Program ☐ Grain ☐ Weld ☐ Wrong Stock Pulled ☐ Out of Sequence ☐ Off-set ☐ Misabeled ☐ Fit/Function ☐ Misaligned/off center ☐ </td> <td style="width: 15%; vertical-align: top;"> Positioned Wrong ☐ Outside Dimensions ☐ Over/Under tolerance ☐ Part Incorrect ☐ Part Lost/Missing ☐ Part Moved ☐ Drawing ☐ Finish ☐ Misread ☐ Turning Sequence ☐ </td> </tr> </table>					Root Cause		FAULT CATEGORY			Environment ☐ Design ☐ Doc/Data ☐ Equip/Tooling ☐ Handling/Pre ☐ Material ☐ Internal Transport ☐ Tribal Knowledge ☐ LOA ☐ Substation ☐ Past Expiry Date ☐ Misidentified ☐	No Re-verification ☐ Operator ☐ Offset/Setup ☐ Supplier ☐ Training ☐ Use for Testing ☐ Poor Information ☐ Rushing ☐ Product Improvement ☐ Process Improvement ☐ Manufacturing Process ☐ Past Due ☐	Pressure/Forced ☐ Bending ☐ Centre Not Concentric ☐ Cracks ☐ Crimp/Kink/Ripple/Wave ☐ Cuffs ☐ Crushing ☐ Heat Treat ☐ Wave/Twist in Tube ☐ Marks/Chatter ☐	Temperature/Cure ☐ Set-up ☐ BOM/Route ☐ Broken/Damage/Defect ☐ Inspection Incomplete/Unqualified ☐ Contamination ☐ Countersink ☐ Cut Too Short ☐ Instructions Incomplete/Unclear ☐ Drill Holes ☐	Power Loss/Surge ☐ Folio/Program ☐ Grain ☐ Weld ☐ Wrong Stock Pulled ☐ Out of Sequence ☐ Off-set ☐ Misabeled ☐ Fit/Function ☐ Misaligned/off center ☐	Positioned Wrong ☐ Outside Dimensions ☐ Over/Under tolerance ☐ Part Incorrect ☐ Part Lost/Missing ☐ Part Moved ☐ Drawing ☐ Finish ☐ Misread ☐ Turning Sequence ☐						
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OTHER : ☐																					

Picklist Print

July 31, 2015 3:28:15 PM

Page 1

Work Order ID: 135170

135170

Parent Item: D350-748-243TRN

D350-748-243TRN

Parent Item Name: Crosstube Installation, High Aft

Start Date: 7/31/2015

Required Date: 8/14/2015

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev: PRELIM New Issue LL 12.05.08

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6021-125		Manufactured	No				Each	103.0000		1			

D6021-125

Crosstube Material - 17-4Ph SS

Location	Loc Qty	Loc Code
HALL	71	
127271	35	
127272	16	
85076	20	
LG	32	
127272	32	

_____ 1 _____ 15/08/13

Item	Qty -243	Part Number	Description
1	X	D350-748-243	CROSSTUBE ASSEMBLY (AS 350/355 HI AFT)
2	1	D6021-125	CROSSTUBE
3	2	D3502-1	SUPPORT
4	2	D5123-7	CLAMP CUSHION
5	1	AETC-1032	INSERT
6	2	MS21920-20 OR MS21920-21/-22	CLAMP (PER DART SPEC. M-MS21920-20/-21/-22)
7	1	NAS1149C0363R	WASHER (OR AN960C10)
8	1	NAS1635-3-8	SCREW (OR MS51958-63)
9	A/R	PROSEAL 890 B-2	SEALANT, AMS-S-8802 CLASS B-2

GENERAL NOTES:

- MATERIAL: MANUFACTURED FROM D6021-125
FINISHED LENGTH AFTER TURNING = 124.70±0.06 (AFTER BENDING/TRIMMING = 122.70 REF)
- FINISH: PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2
PAINT OUTSIDE PER DART QSI 005 4.2
- TOLERANCE: PER DART QSI 018 UNLESS OTHERWISE NOTED.
WALL THICKNESS ECCENTRICITY PER DART QSI 038 7.2
MIN. ALLOWABLE WALL IS -0.020 FROM NOMINAL
- UNITS: INCHES UNLESS OTHERWISE NOTED.
- BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- IDENTIFICATION: DART PART NUMBER "D350-748-243" AND BATCH NUMBER ON INSIDE OF CUFF
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- WEIGHT: 29.85 lbs
- PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.290 HOLE.
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.

TURNING

- BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER BENDING.

BENDING

- BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES PER SIDE. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D. ON TOP HALF OF BEND, AND 8% ON BOTTOM HALF OF BEND.
- MAX AMPLITUDE OF RIPPING ALONG BENT PORTION OF THE TUBE IS 0.030 (ZN A1-3)
- MAX TWIST: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.38 (ZN C1-3).

ASSEMBLY

- TO INSTALL D3502-1 SUPPORT: ABRASE MATING SURFACE OF SUPPORT AND CROSSTUBE WITH 180-GRIT SANDPAPER AND REMOVE RESIDUE WITH MEK (OR EQUIVALENT). APPLY A 0.02" TO 0.05" THICK LAYER OF PROSEAL 890 CLASS B-2 (OR AMS-S-8802 CLASS B-2) SEALANT TO MATING SURFACE OF SUPPORT.
- TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER PROSEAL 890 SEALANT HAS CURED FOR 72 HOURS.

UNDER REVIEW

15/14/20
LRF 15-341

RELEASED

2015 MAR 18
EJN 15-547

A	NEW ISSUE	CP	15.01.21
REV.	DESCRIPTION	BY	DATE
DESIGN			
DRAWN			
CHECKED			
MFG. APPR.			
APPROVED			
DE APPR.			
DATE	15.01.21		

DART AEROSPACE LTD
HAWKESBURY, ONTARIO, CANADA

DRAWING NO. D350-748-243
TITLE CROSSTUBE (AS 350/355 HI AFT)

REV. A
SHEET 1 OF 4
SCALE NTS

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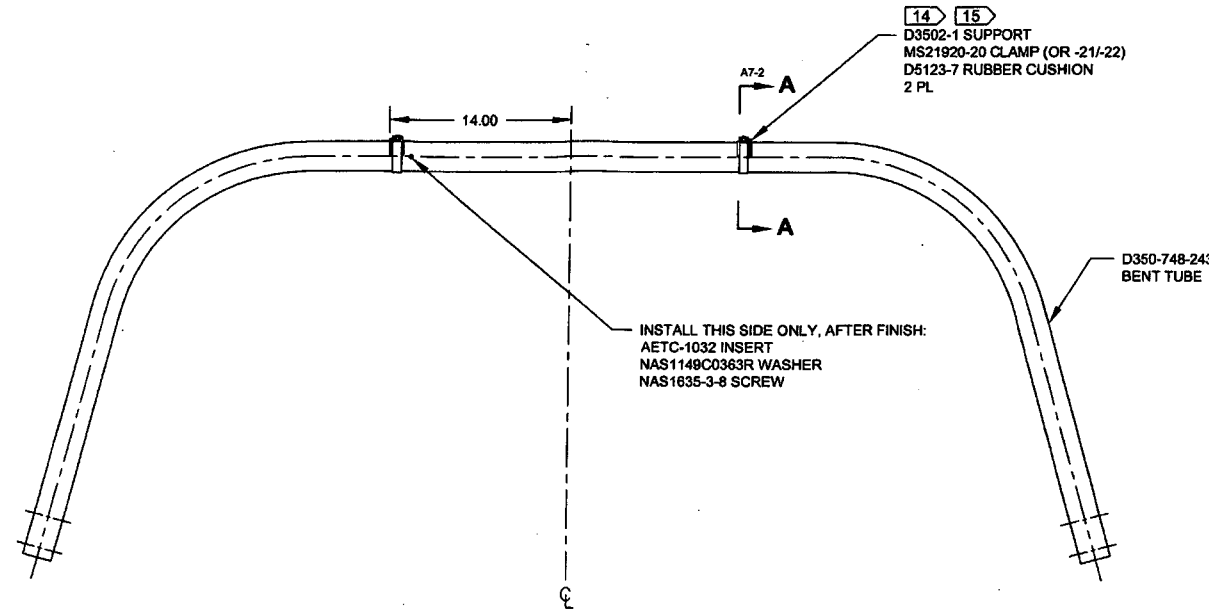
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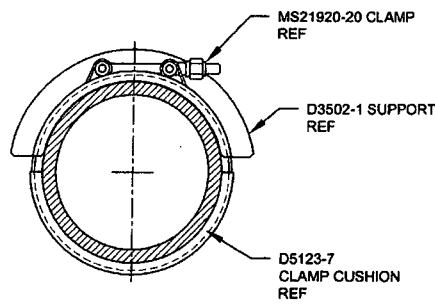
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**D350-748-243
ASSEMBLY DETAIL**



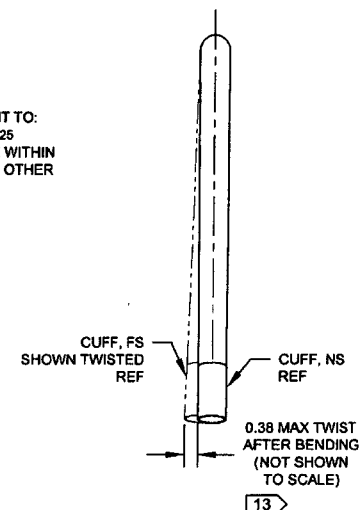
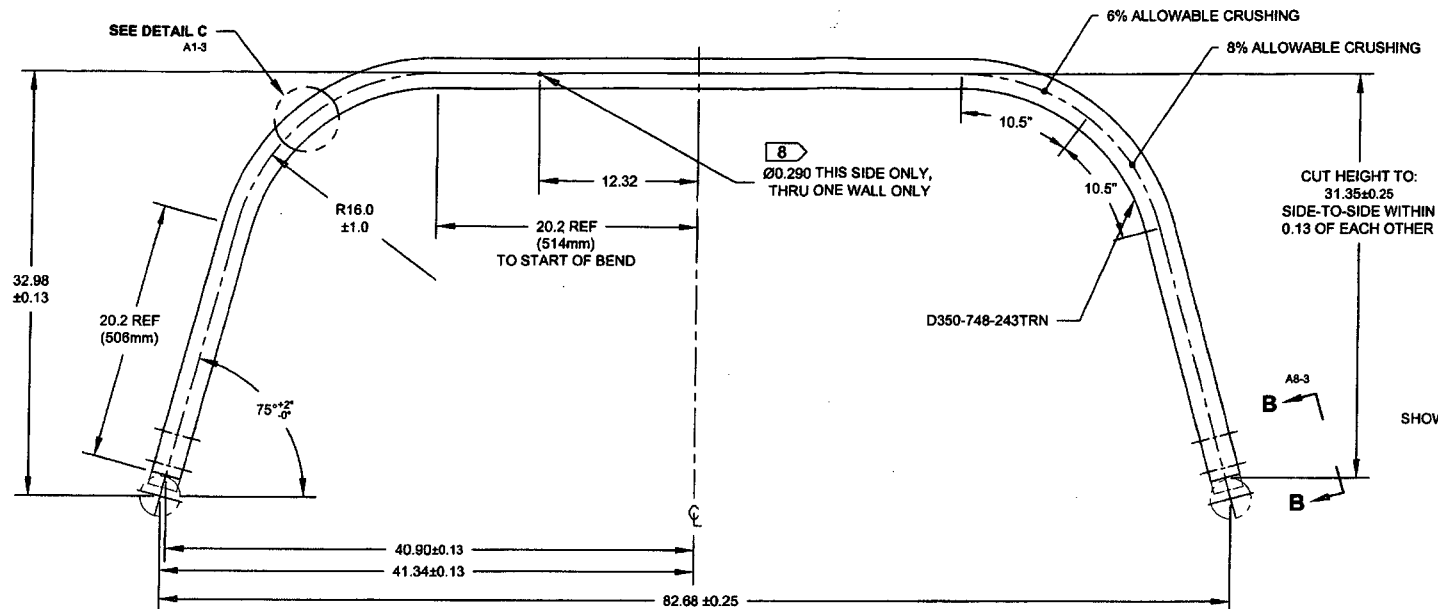
SECTION A-A D4-2
SCALE 6X

UNDER REVIEW
15/4/20

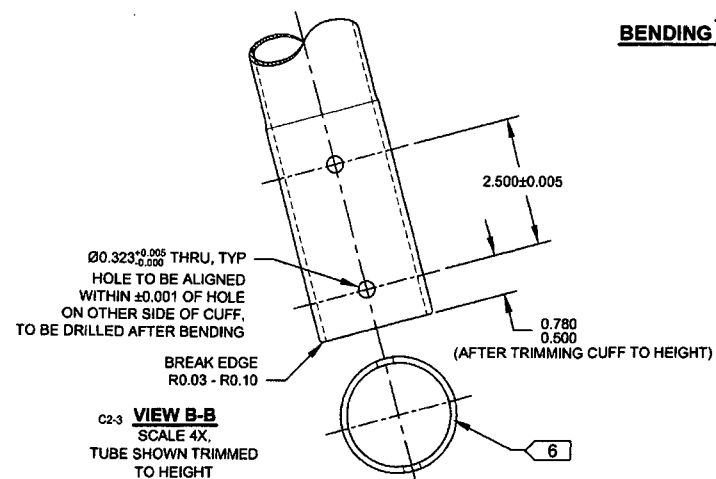
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2015 MAR 18

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CHECKED	A.P.	DRAWING NO.	REV. A
MFG. APPR.	[Signature]	D350-748-243	SHEET 2 OF 4
APPROVED	[Signature]	TITLE	SCALE
DE APPR.	[Signature]	CROSSTUBE (AS 350/355 HI AFT)	NTS
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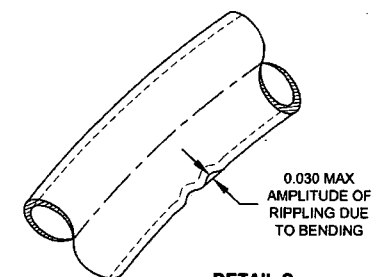


**D350-748-243
BENDING AND DRILLING DETAIL 11**

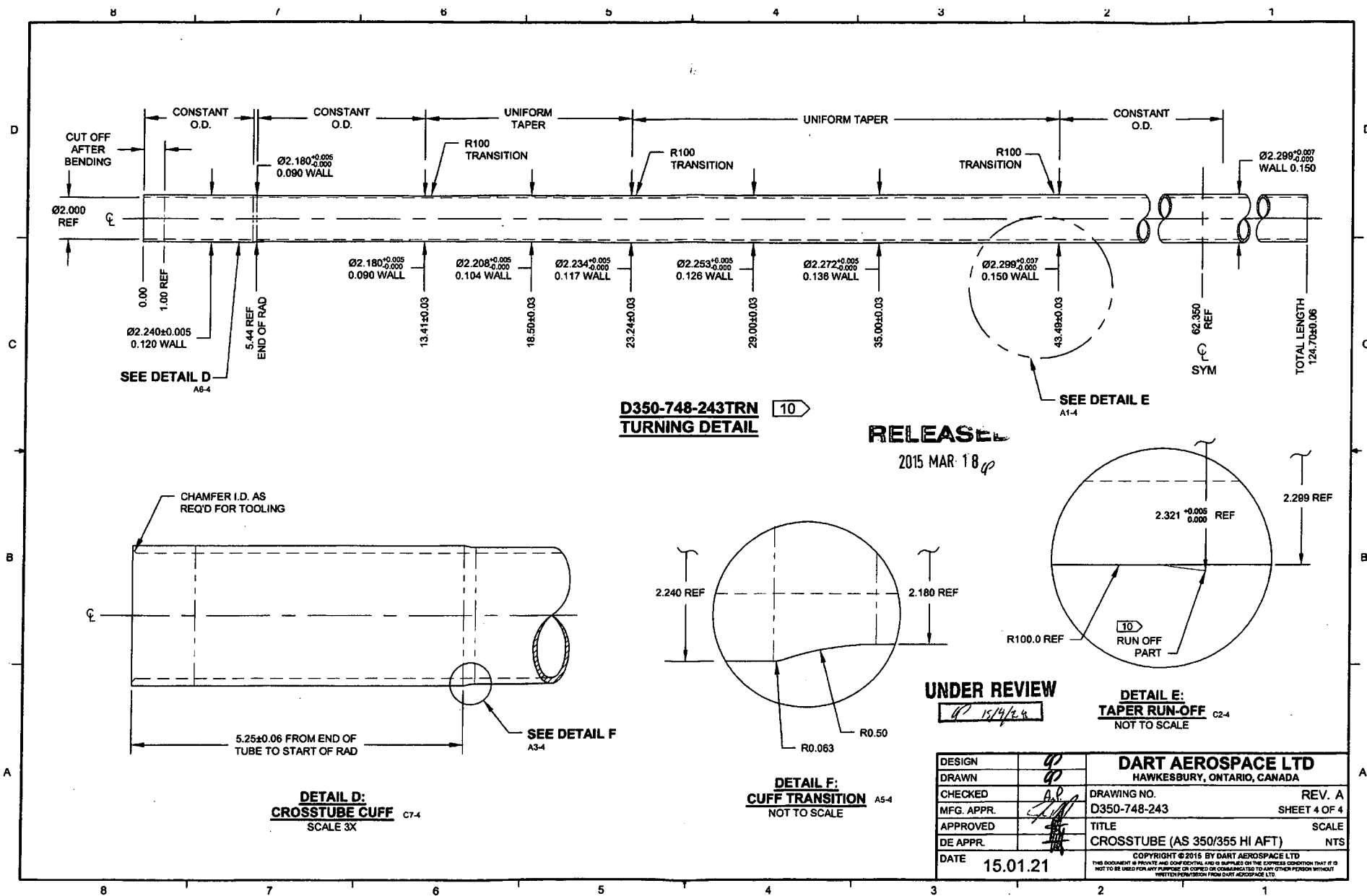


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2015 MAR 18

UNDER REVIEW
15/14/12



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CHECKED	<i>A.P.</i>	DRAWING NO.	REV. A
MFG. APPR.	<i>[Signature]</i>	D350-748-243	SHEET 3 OF 4
APPROVED	<i>[Signature]</i>	TITLE	SCALE
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D350-748-243TRN 10
TURNING DETAIL

RELEASE
 2015 MAR 18

UNDER REVIEW
 15/4/24

DETAIL E:
TAPER RUN-OFF C2-4
 NOT TO SCALE

DETAIL D:
CROSSTUBE CUFF C7-4
 SCALE 3X

DETAIL F:
CUFF TRANSITION A5-4
 NOT TO SCALE

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CHECKED	10	DRAWING NO.	REV. A
MFG. APPR.	10	D350-748-243	SHEET 4 OF 4
APPROVED	10	TITLE	SCALE
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DART AEROSPACE LTD		Work Order:	135170
Description: Crosstube Assembly (AS350/355 High Aft)		Part Number:	D350-748-241
Inspection Dwg: D350-748-241 Rev: H A <i>mm</i>		Page 1 of 2	

243
mm

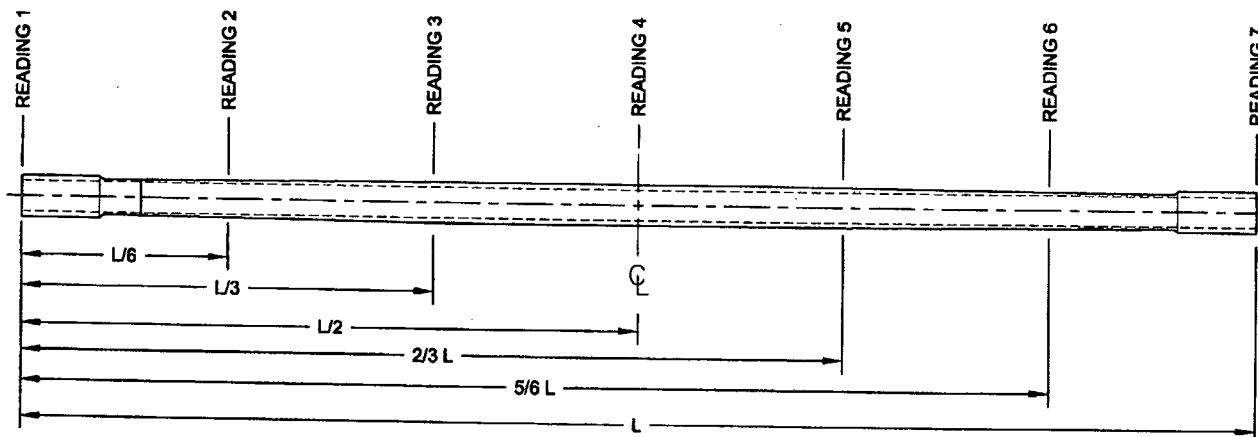
FIRST ARTICLE INSPECTION CHECKLIST

Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.240	+0.005/-0.000	2.244	✓	vern	CNC-08
	2.180	+0.005/-0.000	2.184	✓		
	2.180	+0.005/-0.000	2.183	✓		
	2.208	+0.005/-0.000	2.212	✓		
	2.234	+0.005/-0.000	2.236	✓		
	2.253	+0.005/-0.000	2.254	✓		
	2.272	+0.005/-0.000	2.276	✓		
	2.299	+0.005/-0.000	2.303	✓		
	0.063	+/-0.010	.063	✓	vern	CNC-08
	5.25	+/-0.060	5.26	✓	u	
	R0.063	+/-0.010	.063	✓	RC	
	R0.50	+/-0.030	.500	✓	u	
SIDE B	2.240	+0.005/-0.000	2.244	✓	vern	CNC-08
	2.180	+0.005/-0.000	2.184	✓		
	2.180	+0.005/-0.000	2.183	✓		
	2.208	+0.005/-0.000	2.211	✓		
	2.234	+0.005/-0.000	2.236	✓		
	2.253	+0.005/-0.000	2.254	✓		
	2.272	+0.005/-0.000	2.276	✓		
	2.299	+0.005/-0.000	2.302	✓		
	0.063	+/-0.010	.063	✓	vern	CNC-08
	5.25	+/-0.060	5.26	✓	u	
	R0.063	+/-0.010	.063	✓	RC	
	R0.50	+/-0.030	.500	✓	u	
	124.70	+/-0.060	124.70	✓	tape	LG-11

DART AEROSPACE LTD		Work Order:	135170
Description: Crosstube Assembly (AS350/355 High Aft)		Part Number:	D350-748-241
Inspection Dwg: D350-748-241 Rev: A P-man L		Page 2 of 2	

247
mm

WALL THICKNESS MEASUREMENT



Location	WALL THICKNESS MEASUREMENT (IN)				Deviation Δw (max-min)	TOLERANCE
	w1	w2	w3	w4		
READING 1 L = 0"	.134	.132	.130	.128	.004	0.030"
READING 2 L = 21	.123	.143	.121	.100	<.043>	
READING 3 L = 42	.147	.173	.168	.148	.026	
READING 4 L = 62	.158	.160	.164	.161	.006	
READING 5 L = 83	.168	.169	.147	.145	.024	
READING 6 L = 104	.139	.140	.110	.096	<.044>	
READING 7 L = 124	.134	.134	.130	.128	.006	

Dwg Δ
0.111 0.011
0.111 0.015

Calibration Result

DAS
47

Actual Block Thickness: 100 - 500

Sitescan 250 Measured Thickness: 100 500

Measured by:	<i>mmf</i>
Date:	15/08/19

Audited by:	9-89
Date:	15-09-16

Preliminary Approval:	
Date:	

Rev	Date	Change	Revised by	Approved
B	12.02.02	Dwg Rev updated (P/O D350-748-201)	KJ	
C	12.06.04	Wall thickness form added	KJ	
D	13.02.27	Dimension 5.25 was 4.26	KJ	
E	14.04.25	122.70 dimension revised to 124.70	KJ	
F	15.04.14	Dwg Rev updated	KJ	

